

Claims

1. Method for video processing, wherein possible movement between successive fields of the images split into even and odd is detected and the mode, i.e. video mode or film mode is determined, characterized in that the sequence of movement or standstill between successive fields is detected and this sequence over a number of fields is stored in a memory, followed by said sequence being compared with patterns inherent to the mode and, if ordinary video mode is detected, median filtering is carried out whereas, if film mode (2:2 pull-down or 3:2 pull-down) is detected, the median filtering is switched off and, in synchronization with the film phase, the even and odd fields which match and are derived from one and the same film image are merged again until the original film image is obtained and said image is repeated until again a following original film image can be constructed by means of the abovementioned merging.

2. Method according to Claim 1, characterized in that if a film mode is detected, the length of the movement sequence which is stored in the memory is shortened.

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X<sup>17</sup> 3. Method according to any one of the preceding claims, characterized in that the movement detection, i.e. the detection of the abovementioned sequence of movement and standstill, can be performed by a three-point median filtering operation, after which the result of said median filtering operation and the incoming information of a following field is filtered by two low-pass filters, the absolute difference of the result of these two low-pass filter is calculated and the differences are summed, the sum, possibly divided by a number, being compared with a threshold value, the result of said comparison forming the abovementioned

sequence, stored in a memory, of the movement and standstill between successive fields.

4. Method according to Claim 3, characterized in that, depending on whether the abovementioned sum is larger or smaller than the threshold value, a different binary number is stored in a memory, the sequence of binary numbers in said memory forming the abovementioned sequence of movement and standstill between successive fields.

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5. Method according to Claim 3 or 4, characterized in that the threshold value is calculated taking into account the luminance value of the current processed image.

6. Method according to Claim 5, characterized in that the total luminance sum is calculated and the nominal threshold value chosen is a specific fraction of said luminance sum, said nominal value optionally being adjusted, in particular being doubled or halved, in order to take account of the processing mode and, if edge boosting is being carried out, to take account of the status of said edge boosting.

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7. Method according to any one of the preceding claims, characterized in that, if film mode is detected, the processing of the data is synchronized with the film phase by using oscillating shift registers to continuously transmit a sequence corresponding to the 2:2 pull-down mode and/or a sequence corresponding to the 3:2 pull-down mode and, if one of the corresponding mode is detected, to synchronize with a synchronization pulse transmitted by the detection of the sequences of movement and standstill between the successive fields.

8. Method according to Claim 7, characterized in that in the event of non-synchronization or detection

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of an error in the film phase, a changeover to film the synchronization mode is carried out, the sensitivity of the detection of movement again being set to a high level and the processing temporarily again being  
5 carried out by median filtering until the film phase is observed again.

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10 9. Method according to any one of Claims 5 to 8, characterized in that in the event of film mode being detected and of synchronization the threshold value is increased so that the sensitivity of the detection of movement or standstill decreases.

15 10. Method according to any one of the preceding claims, characterized in that the incoming signals are subjected to edge boost by said signals being filtered by means of two phase-linear filters having a coefficient sum of 0, namely a band-pass filter preferably having the coefficients -1 0 2 -1 and a  
20 high-pass filter having, for example, the coefficients -1 2 -1, after which the result of these filtering operations is merged and scaled.

25 11. Method according to any one of the preceding claims, characterized in that the video signals to be processed are subjected to doubling or quadrupling and/or field rate doubling.

30 12. Method according to Claim 11, characterized in that the interlaced video signals to be processed are converted into non-interlaced video signals by means of a 3-point median filtering operation whose result is stored in a memory bank, and a field rate upconversion is performed by said memory bank constantly being read  
35 out at a higher rate than normal, preferably double the rate, for example at a frequency of 100 or 120 Hz instead of 50 or 60 Hz.

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13. Method according to Claim 11, characterized in that the interlaced video signals to be processed are converted into non-interlaced video signals by means of a 3-point median filtering operation whose result is stored in a first memory bank and these video signals are simultaneously subjected to an interpolation whose result is stored in a second memory bank, after which successively a line from the one and a line from the other memory bank is read, and a field rate upconversion is performed by the contents of successively the first and the second memory bank constantly being read out at a higher rate than normal, preferably double the rate, for example at a frequency of 100 or 120 Hz instead of 50 or 60 Hz, and, for correct interlacing, the outgoing frame pulse being shifted, every other frame, by half a line.

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~~14. Apparatus for employing the method according to any one of the preceding claims, characterized in that it includes a movement detector (11), a film mode/video mode detector connected thereto, a synchronizer (21) to synchronize processing with the film phase, and a film processor proper.~~

25 15. Apparatus according to Claim 14, characterized in that the movement detector (11) is connected to a median filter (1) having as inputs the current field and the next field of the video images, and includes two low-pass filters (13 and 14), one of which connects to the output of the median filter (1) and the other has as an input (12) the information of the next incoming field, a differentiator (15) which connects to the two low-pass filters (13 and 14) to calculate the difference between the outputs of these, a summator (16) connected to said differentiator (15), a counter (17) connected to said summator (16) and a comparator (18) connected thereto for comparing the output of the counter (17) with a threshold value.

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16. Apparatus according to Claim 15, characterized in that the film mode/video mode detector includes a shift register (19) in which the result of the comparator (18) over a number of fields is stored, so that a comparison is possible with a pattern inherent to a specific mode.

Sub A67 17. Apparatus according to any one of Claims 14 to 16, characterized in that the synchronizer (21) includes at least one oscillating shift register or so-called "syncer" (22 or 23) which continuously transmits the sequence corresponding to the sequence of movement and standstill between successive fields for 2:2 pull-down or 3:2 pull-down, respectively, and preferably two shift registers or "syncers" (22 and 23), one for 2:2 pull-down and one for 3:2 pull-down.

18. Apparatus according to any one of Claims 14 to 17, characterized in that the film processing proper includes means for merging matching fields of a film image and for repeating the merged images.

19. Apparatus for video processing, characterized in that they include means for employing doubling and/or means for performing quadrupling, and a field rate converter from, for example, 50 or 60 Hz to 100 or 120 Hz.

Sub A8 20. Apparatus according to any one of Claims 14 to 18 and according to Claim 19, characterized in that as well as a movement detector (11), a film mode/video mode detector, a synchronizer (21) and a film processor it includes means for employing doubling and/or means for performing quadrupling, and a field rate converter.

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21. Apparatus according to Claims 15 and 20, characterized in that the means for performing doubling and/or the means for performing quadrupling include a

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median filter (1) which also forms part of the movement  
detector (11).

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